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Demand for Military Spending: The case of the MENA Region

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Abstract:

Arab Spring and the domestic unrest and the threat of terrorism that followed are not the main causes of the recent spike in military spending in the region, as the bulk of arms purchases have largely been conventional heavy weaponry, such as combat aircraft, armored vehicles, and missile systems. The results indicate that military spending in the MENA region does exhibit high income elasticity and status is further signaled through regional clubs such as the Arab League. MENA countries face substantial opportunity cost of military spending and only weakly respond to local threats. The so-called 'resource curse' is not a strong indicator of military posture in MENA especially within the neoclassical demand model setting and robust estimation that account for dynamics and endogeneity.

Keywords: Threat; Nuclear arsenal, Demand for Military Expenditure; Middle East North Africa; Dynamic Panel Data; status; positional goods

JEL Classification: H56, C23

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Introduction

The Middle East and North African (MENA) region remains volatile. There is a power struggle in Libya, civil war in Syria and war in Yemen. Iran and Israel are either considered regional threats or each see the region as a threat. Recent data from the Stockholm International Peace Research institute (SIPRI) collaborate the volatility of the region. Military spending in the Middle East amounted to $196 billion in 2014, an increase of 5.2 per cent over 2013, and 57 per cent since 2005 (SIPRI 2014 report).

Sandler and George (2016) provide details by selected countries within MENA region to highlight phenomenal increases in military spending ranging from 1410% increase in Algeria to a modest 35% increase in Morocco for the post-Cold War period. While Arab countries continue to dominate the defence burden rankings (military spending as a ratio of GDP), the 2017 SIPRI report also identified interesting trends in the so called MENA region. First the fall in oil since 2014 has led to sharp declines in military spending. Second, these same oil-exporting nations have prioritized their fiscal allocation towards social sectors (SIPRI, 2017).

The rise in defense spending in the Middle East raises concern over the potential for a regional arms race, which would make an already volatile region more unstable. However, recent research in international affairs and economics argues that military expenditures in the region is not only driven by the national security environment but also and most importantly as a way to provide rents to militaries and their political patrons (Springborg, 2011). 'Resource curse' is often mentioned as another driver of military spending in the region (Bannon and Collier, 2003; Ali and Abdellatif, 2015).

Arab Spring and the domestic unrest and the threat of terrorism that followed are not the main causes of the recent spike in military spending in the region, as the bulk of arms purchases have largely been conventional heavy weaponry, such as combat aircraft, armored vehicles, and missile systems. We revisit the study of the demand for military expenditures with a particular emphasis on the responsiveness of military spending to threat. We use the extended time series on military expenditures from SIPRI along with a comprehensive treatment of threat variables that span local, regional and global spheres.

Specifically, we employ strategic clusters as discussed and developed in Markowski and Tani (2005) and operationalize it by adapting it to the MENA region. Global threat variables are further augmented by using nuclear arsenal data from Douch and Solomon (2014). We also incorporate the notion of status seeking as discussed in Douch and Solomon (2014 and 2016) to examine whether military spending in MENA region can be considered a positional good.

The results indicate that military spending in the MENA region does exhibit high income elasticity and status is further signaled through regional clubs such as the Arab League. MENA countries face substantial opportunity cost of military spending and only weakly respond to local threats. The so-called 'resource curse' is not a strong indicator of military posture in MENA especially within the neoclassical demand model setting and robust estimation that account for dynamics and endogeneity.

The rest of the study is structured as follows. In the next section we discuss the relevant literature and study scope. Section 3 presents the empirical setup and discusses some key estimation techniques. Section 4 presents the data and results and the last section concludes and points to future studies.

2. Brief Literature Review

Springborg (2011) gives a useful spectrum of military business involvement in the Middle East, starting from high (Egypt and Iran, with economic activities spanning almost the entire national economy), though Syria and Sudan (where military business activity is restricted mostly to military business) through Algeria (where the military prefers the hidden world of side-payments rather than direct economic involvement to low involvement (the Gulf Cooperation Council-GCC countries and Tunisia).

As mentioned earlier the 'resource curse' explains the rising trend in military expenditures in MENA regions. While Bannon and Collier (2003)underscore this relationship, Ali and Abdelatif (2015) provide a more nuanced relationship with oil and forestry showing positive and significant results while other types of resources (coal, etc) tend to sho no significant relationship. Aside from public choice considerations, Adams and Ciprut (1995) and Markowski and Tani (2005) focus on the development of a security cluster to better reflect the strategic and spatial interactions between nations to tease out a detailed model of military expenditures determinants.

The other relevant literature focuses on the use of more robust econometric techniques to better understand and estimate dynamics and strategic interactions. Dunne and Perlo-Freeman (2003) provide relevant discussions on the importance of explicit incorporation of dynamics in military spending models. The extended SIPRI data-set (with large T) allows one to model not just the dynamics, but also the heterogeneity, cross-section dependence in panels and to test for structural breaks (Smith, 2017). Perlo-Freeman (2017) discusses the process that led to the extension of the SIPRI time series and country data but acknowledges the limitations of measurement and the concerns of validity, reliability and comparability of the data. More specifically for the MENA study, the extended treatment of threat proxies by including neighbouring countries' military spending may lead to a reduced time period and countries. If we want to keep the panel balanced then the cost is reduced T and N.

Smith (1995) is an excellent reference for the understanding of the theory and empirics of military demand modeling. We follow the neoclassical social welfare maximization model. All demand for military expenditures model ought to have a social welfare maximization model subject to budgetary constraints and a security variable distinguishing threats and strategic spillins (if there is some sort of alliance). These models then add additional shift parametrization variables such as political parties, etc.

For MENA we have the GDP variable that is part of the budget constraint, there is no price variable since we do not have a military price variable or it is assumed that there is no difference between civilian and military price (See Solomon, 2005, for further discussion). From the security function we have a number of threat variables. The Markowski and Tani (2005) security cluster weighted by distance ought to provide a reasonable proxy for threats. The Arab League and GCC are more an economic club than a military alliance. As such, the relationship with military expenditures is purely positional (status).

For variables that can shift the demand curve, the opportunity cost of military spending (see Douch and Solomon, 2014 and Douch and Solomon, 2016) is key. The public choice arguments regarding rent seeking by the military bureaucracy and resource curse are additional parameters for consideration.

2.1 Defining the MENA region

The following countries are typically included in MENA*: Algeria, Bahrain, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates and Yemen.*[3]

Table 1 presents the defence burden figures for 2016. Note that 7 out of the top 10 countries belong to the MENA region. The MENA countries considered doubled (113%) their military spending during the period 1990-2014 (Figure 1). As shown in Figure 1, the trend in other regions such as the Sub-Saharan Africa (72%) and South America (54%) is rather muted.

It is a stylized fact that the Middle East and North Africa region devote a disproportionate share of their revenues to military expenditure. It is not however clear if all countries in the region react to external or internal threats, or just means to provide rent to the military establishment (Springborg, 2011).

Following Adams and Ciprut (1995) and Markowski and Tani (2005) who used the reaction-response models in which a country's decision to change military expenditure level at time, *t*, takes into account military spending of all allies and enemies at time, *t-1*, we develop '*strategic clusters*' for all countries in the region. This concept of strategic cluster is used to identify group of nations whose combined defense expenditures are *hypothesized* to influence the military spending of the reference country.[4] We also use the inverse of distance to reduce the influence of military spending by more geographically remote country in a given cluster. As noted in Markowski and Tani (2005), the selection of strategic clusters is prone to subjectivity in that it reflects the authors' perception of security concerns in the region.

Table 2 summarizes strategic clusters for all countries in the region. Panel 2.1 identify local clusters including countries perceived as friends or enemies amongst neighboring countries. Most GCC countries and Egypt perceive Israel and/or Iran as potential threats. Both countries are then in the strategic clusters for these countries. Saudi Arabia in the other hand is the 'big brother' and perceived as friend by these countries. Its military spending is then considered complementary to

[3] Excluding Djibouti, Ethiopia, Mauritania, Sudan, and Palestinian territories which are sometime included in the MENA region.
[4] In this exercise, we assume that alliance relationships and tension between countries remain intact over the sample period. Clusters are not dynamic and don't change over time.

their own spending, constituting a positive spillin in this case. In panel 2.2, regional power with impact on the MENA region military spending are identified. Israel, Iraq (for the period 1970-1990), Russia (1990-2014), Turkey and Iran are again considered in this cluster. Finally, and in order to account for global power nations and their inevitable impact on the defense spending of MENA, panel 2.3 identify USA and USSR (1970-1990) as the global cluster.

In dealing with this a priori strategic clusters, our main concern is to include all nations whose military expenditure is, in our view, likely to influence the spending of a particular country under consideration. The divide between local, regional and global clusters is again to show that, in theory, a country in the region will not react the same way to threats from a neighboring enemy or to a global power. Iraq versus Iran in the 1980s and Iraq against USA in the first and the second gulf wars are clear examples of how all this dynamics work.

3. Econometric Approach

In order to study the determinants of military expenditures in the context of MENA countries, we perform a regression analysis on the data using the following equation,

$$ME_{it} = \beta_0 + \beta_1 I_{it} + \beta_2 OG_{it} + \beta_3 \Delta G7GDP_t + \beta_4 WLCTH_{it} + \beta_5 RLTH_{jt} + \beta_6 TH_t + \beta_7 ARBL_{it} + \beta_8 NATR_{it} + \varepsilon_{it}$$

Clearly, as discussed later, there are both economic and strategic factors which could be important in the determination of military spending in the region.

From an econometric perspective and as it is well known in the literature, allowing for the presence of subject-specific unobserved heterogeneity represents one of the key advantages of using panel data. In this context, we deal with this unobserved heterogeneity by using the one-way fixed effects models, or by taking first differences if the second dimension of the panel is a proper time series, i.e. dynamic panel. Dynamic panels in which the regressors include the lagged dependent variable are developed around the work of Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) for the two-step system extension. This approach is based on allowing for the modeling of a partial adjustment mechanism, and make use of the Generalized Method of Moments (GMM) to construct efficient estimates of the dynamic panel data model. The basic idea behind the use GMM or any method of instrumental variables is to find a set of variables, termed instruments, that are correlated with the explanatory variables in the equation, but uncorrelated with the disturbances.

Let us consider the matrix form of our model, assuming a dynamic form our model can be written as,

$$\Delta ME_{it} = \Delta ME_{it-1}\lambda + \Delta X_{it}\beta + \Delta\varepsilon_{it}, \quad i = 1, ..., N$$

where X_{it} is the matrix of explanatory variables in the model.

The GMM system estimation method being based on the first difference of the model, we estimate the *K+1* parameters of the model, $\theta = (\lambda, \beta')'$, by making use of the *T(T-1)(K+1/2)* moment conditions. The standard method of moments estimator consists of solving the unknown parameter vector θ by equating the theoretical moments with their empirical counterparts or estimates. By transforming the regressors by first differencing in the GMM system, the fixed country-specific effect is removed, because it does not vary with time. The Arellano and Bond GMM estimator of θ is then given by,

$$\hat{\theta} = \underset{\theta}{ArgMin}\left(\frac{1}{N}\sum_{i=1}^{N}\Delta\varepsilon_i' W_i'\right)\Upsilon^*\left(\frac{1}{N}\sum_{i=1}^{N}\Delta\varepsilon_i W_i\right)$$

where the moment conditions can be represented as $E\left(W_i\Delta\varepsilon_i\right)=0$. Υ^* is the optimal weighting matrix given by the inverse of the long run variance covariance matrix and estimated by,

$$\hat{\Upsilon}^* = \left[E\left(\frac{1}{N^2}\sum_{i=1}^{N}\Delta\varepsilon_i W_i \; \Delta\varepsilon_i' W_i'\right)\right]^{-1}.$$

System GMM is probably the most popular method of estimation used in the literature to solve dynamic panel models. In this work, we use the two-step system GMM and estimate the parameters of interest in our model. In our empirical analysis, the usual battery of tests is carried out to get the best specifications and validate our set of instruments.

In order to compare our results with previous studies, we also use the fixed effects estimator. In this setup, the error term can be divided into two component, $\varepsilon_{it} = \mu_i + \nu_{it}$. A fixed effect model assumes systematic differences among panel observations captured by dummies, where individual specific intercepts, μ_i, are assumed to be fixed and known parameters included in the constant term.

Furthermore, in order to assess simultaneously both the short- and long-run we also consider the ARDL technique is this study. The ARDL approach estimates the effect of a particular variable on military expenditures separating the short-run from the long-run effects (Bentzen and Engsted, 2001). ARDL is based on Pesaran (1997) and on Pesaran Shin and Smith (2001) where the dynamics is incorporated into the error correction model by using lags of the dependent and independent variables which allows for rich dynamics in the sense that the dependent variable adapts to changes in the explanatory variables. The ARDL (p, q1, …, qk) technique, where p is the lag of the dependent variable and qj is the lag of the independent variables (j = 1, 2, ..., k) can be stated, using the same terms as before, as follows,

$$\mathrm{ME}_{i,t} = \sum_{j=1}^{p} \lambda_{ij} \mathrm{ME}_{i,t-j} + \sum_{j=0}^{q} \beta_{ij} X_{i,t-j} + \mu_i + \varepsilon_{it}$$

Following the discussion in Pesaran, Shin, and Smith (1999), and if the variables in (1) are, for example, I(1) and cointegrated, then the error term is an I(0) process for all i . This feature implies an error correction model in which the short-run dynamics of the variables in the system are influenced by the deviation from equilibrium. Thus it is common to reparametrize (1) into the following error correction equation:

$$\Delta\mathrm{ME}_{i,t} = \phi_i (\mathrm{ME}_{i,t-1} - \theta_i' X_{i,t}) + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta\mathrm{ME}_{i,t-j} + \sum_{j=0}^{q-1} \beta_{ij}^{*} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it}$$

where Δ is the first difference operator; the parameter $\phi_i = -(1 - \sum_{j=1}^{p} \lambda_{ij})$; $\theta_i = \sum_{j=0}^{q} \beta_{ij} / (1 - \sum_k \lambda_{ik})$; $\lambda_{ij}^{*} = -\sum_{m=j+1}^{p} \lambda_{im}, j = 1, 2, ..., p-1$ and $\beta_{ij}^{*} = -\sum_{m=j+1}^{q} \beta_{im}, j = 1, 2, ..., q-1$. Of interest, the parameter ϕ_i which is the error-correcting speed of adjustment term and the vector θ_i which contains the long-run relationships between the variables. The error-correcting term ϕ_i is expected to be significantly negative under the prior assumption that the variables show a return to a long-term equilibrium.

3.1 Estimation Model

As discussed earlier, we follow the traditional neoclassical empirical model where a state maximizes social welfare including security subject to budge constraints. We utilize a panel regression method for 18 MENA countries for the period 1970 to 2014. The estimated equation is:

$$ME_{it} = \beta_0 + \beta_1 I_{it} + \beta_2 OG_{it} + \beta_3 \Delta G7GDP_t + \beta_4 WLCTH_{it} + \beta_5 RLTH_{jt} + \beta_6 TH_t + \beta_7 ARBL_{it} + \beta_8 NATR_{it} + \varepsilon_{it}$$

where:

I_{it} = income proxied by GDP.

OG_{it} = non-defence expenditures computed as the total government expenditures minus defence spending.

$\Delta G7GDP_t$ = a measure of global economic activity represented by changes in G7 nations GDP. According to Markowski and Tani (2005) military expenditures may be used to stimulate economic conditions and one possible variable to proxy global economic condition is USA GDP. We use G7 as a more inclusive global measure.

$WLCTH_{it}$ = Local threat and friendly spill in variable constructed using strategic clusters weighted by distance (we also have non weighted variable $NWLCTH_{it}$) and constructed as follows,

$WCLTH_{it} = \sum \frac{MilEx_{it}}{D_i}$ and $MilEx$ is military expenditures for countries in the country-specific strategic cluster (see Table 2). This variable is used alternatively with the non-weighted local threat constructed the same way as WCLTH without controlling for distance, i.e., $NWCLTH_{it} = \sum MilEx_{it}$.

$RLTH_{jt}$ = Regional Threat or trigger for increase own military expenditure (see Table 2)

TH_t = a measure of global instability represented by five different variables (used once at a time in our estimated equation).

$ARBL_{it}$ = a measure of regional coalition, Arab League membership. While this regional grouping is not the same as traditional military alliances, it does provide a signal for status seeking within the MENA region. It is the sum of all Arab league members Milex. Used alternatively with GCC.

GCC_{it} = another regional coalition measure (the 6 Arab golf nations). It is the sum of all military spending of the GCC members.

$NATR_{it}$ = To control for the abundance of natural resources, particularly oil, in the region, *NATR* is constructed by summing the real rents (in 2015 $US) for the giving country from its natural resources. As an alternative, we estimate our model with disaggregated natural resources variables: Oil_{it}, $Mineral_{it}$, $NatGas_{it}$, $Coal_{it}$ and $Forest_{it}$.[5] As shown in the literature (Ali and Abdellatif, 2015), natural resources rents provide incentives to reward the protector of the states, that is, the military.

4. Data and Estimation Results

4.1 Data

Level data are normalized using US and constant 2015 dollars. SIPRI is the main source for military expenditures data while the World Bank economic indicators provide data on government spending (subtracting military spending), natural resources rent and GDP. Note that the government spending variable (OG) is a proxy for the trade-off states face in their constrained optimization of social welfare.[6]

Threat remains ill-defined in the demand for military spending models. In order to shade light on this important variable we examine a number security structures for the MENA region. In addition to the local, regional and global threat variables described in Table 2, we use additional global insecurity measures in the form of nuclear arsenal. These global insecurity measures are discussed in Douch and Solomon (2014) and include total intercontinental ballistic missiles (NICM), total stock of nuclear arsenal (NTOT), nuclear explosion (NEX) and the doomsday clock.

[5] Results for the disaggregate variables are available upon request.

[6] We used Polity variables to proxy institutions. However, the overall results of the study remain unaffected. The tables can be provided upon request

4.2 Estimation Results

Table 3 presents the fixed effect panel estimate results. Each column on the table denotes alternate proxies for global threats and security structures. Regardless of specification, the income response of military expenditures exceeds one. This is consistent with recent studies such as Markowski et al (2017) and indicates military spending as a positional (status) good. Military spending is sensitive to trade-offs when competing with social spending. This provides some evidence to the SIPRI (2017) report on relative increases in social spending observed in MENA regions. However, one cannot rule out the possibility that some domestic security spending may be reflected in the other government spending figures.

The regional clubs Arab League and Gulf Cooperation Council tend to generate positive spillins or the motivation to "Keep up with the Neighbours". The response to these regional proxies is significant and positive in almost all the specification. On average, a 10 percent increase in club spending results in a MENA state military spending of 7.6 percent.

Another important factor affecting military spending in the MENA region is the so-called 'resource curse'. Ali and Abdellatif (2015) find that rents from oil and forest products lead to increase in military spending while other natural resources such as coal and gas tend to have negative effect. The aggregate natural resources rent variable in this study is negative and significant in all variations depicted in Table 3. Although not shown here, disaggregated results by natural resources type remain inconclusive.

The threat variables are significant in the majority of the cases as expected. However, the weighted local security cluster tends to have a weaker effect (a 100% increase in the weighted local cluster results in only 5% increase in military spending). We observe stronger response to global threat proxies such as nuclear intercontinental missiles, the doomsday clock and international clusters (US and USSR 1970-1990). Another important finding regarding the threat proxies relate to regional threats. Recall that regional threats include military spending of Iran, Israel, Turkey as well as Russia (for the period 2000-2014) and Iraq (1980-1990). In all model specifications, the fixed effect panel estimate (Table 3) exhibits a negative and significant response to regional threats.

With the availability of the extended military spending dataset from SIPRI one can tease out strategic interactions fully to understand spillins and spatial issues. In addition, we can explicitly incorporate dynamic aspects of and military spending and these are detailed in Table 4. Specifically we employ the ARDL approach to cointegration to estimate both the long and short run effects. Table 4A presents the long run effects and military spending continues to exhibit strong income elasticity. MENA states face tradeoffs between social and security demands and react strongly and positively to Arab league nations' spending.

Natural resources do not impact military spending in the long run while local threats are only weakly significant. Negative response to the regional threat persists in the long run but the proxy is significant in only three specifications. The long run estimates also show similarly weak response to global threats. Table 4B presents the short run dynamics. In general military expenditures in MENA countries respond to income and Arab League's spending in the short run. None of the security cluster proxies are significant in the short run and the aggregate natural resources proxy also remains insignificant. In the short run status seems to trump threat.

In the empirical literature, the development and application of Generalized Methods of Moments (GMM) has become particularly popular. Introduced by Arellano-Bond (1991), Arellano-Bover (1995) and Blundell-Bond (1998), the difference and the system GMM estimators are designed to extract causal relationships from data on a large number of individuals over time. These instrumental variable methods are usually used to tackle omitted variables, endogeneity and measurement error problems and avoids using weak instruments in the System GMM setup. This paper considers the dynamic panel data using a two-step system GMM (Blundell-Bond, 1998) over other panel data techniques. Blundell, Bond and Windmeijer (2001) and Roodman (2009) provide excellent summaries of the GMM methodology.

Table 5 presents the GMM estimate to further the robustness diagnostics. Note that we are unable to reject the null that all instruments are uncorrelated with the residuals. The high income elasticity is once again evident. Similarly the trade-off among security and social spending remain strong using the system GMM estimates. Response to various levels of security clusters are not significant. For the first time the additional status proxy, Arab League or Gulf Cooperation Council is not significant.

5. Conclusions

The various estimation methods and model specifications reveal the following insights. First regardless of models or econometric methods, the high income elasticity of military expenditures is consistent. Second, MENA countries face large tradeoff elasticities between security and social spending. Third, in majority of the models and estimation techniques status is signaled through regional clubs such as the Arab League. Fourth, status and not necessarily local and regional threats drive military spending in MENA countries. Finally, the so-called ‘resource curse’ is not a strong indicator of military posture in MENA especially within the neoclassical demand model setting and robust estimation that account for dynamics and endogeneity.

While the results indicate a potential inclination towards status as opposed to security in the determination of military expenditures, the result remain tentative until a comprehensive military capabilities based measure is developed. However, the use of comprehensive threat proxies show merit in future models of military demand models.

References

Adams, F.G. and J. V. Ciprut (1995) The demand for defense in East Asia: Modeling security alternatives, Defence and Peace Economics, 6:1, 43-58,

Arellano, M., and S. Bond (1991). ‘Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations,’ Review of Economic Studies, 58, 277-297.

Arellano, M., and O. Bover (1995). ‘Another Look at the Instrumental Variable Estimation of Error-Components Models,’ Journal of Econometrics, 68, 29-51.

Bannon, I. and Collier, P. (2003) Natural resources and conflict: What can we do? In Natural Resources and Violent Conflict, edited by I. Bannon and P. Collier. Washington, DC: World Bank, 1–16.

Bentzen I., and Engsted T (2001), A revival of the autoregressive distributed lag model in estimating energy demand relationship, Energy, volume 26, 45-55.

Blundell, R. and S. Bond, 1998, Initial Conditions and Moment Restrictions in Dynamic Panel Data Models, Journal of Econometrics 87, 115-143.

Blundell, R., Bond, S. and F. Windmeijer (2001). Estimation in dynamic panel data models: Improving on the performance of the standard GMM estimator. In: B.H. Baltagi, T.B. Fomby, R. Carter Hill (eds.), Nonstationary Panels, Panel Cointegration, and Dynamic Panels. Advances in Econometrics, Volume 15, Emerald Group Publishing Limited, 53- 91.

Douch M. and B. Solomon (2014) Middle Powers and the Demand for Military Expenditures Defence and Peace Economics 25(6): 605-618.

Douch M. and B. Solomon (2016), A dynamic panel analysis using SIPRI’s extended military expenditure data: The case of Middle Power nations, The Economics of Peace and Security Journal 11(2).

Dunne, JP and S. Perlo-freeman (2003) The demand for military spending in developing countries: A dynamic panel analysis Defence and Peace Economics - 14(6) Pages 461-474

Hamid E. Ali & Omnia A. Abdellatif (2015), “Military Expenditures and Natural Resources: Evidence from Rentier States in the Middle East and North Africa”, Defence and Peace Economics, 26:1, 5-13.

Enders, W., Hoover, G. A. and Sandler, T. (2016) “The Changing Nonlinear Relationship between Income and Terrorism”, Journal of Conflict Resolution, 60(2), 195–225.

Hartley K. (1997) The Cold War, Great-Power traditions and military posture: Determinants of British defence expenditure after 1945. Defence and Peace Economics 8 (1) 17-36.

Markowski, S. and M. Tani (2005), “Defense expenditure, spill-ins and threats in Asia-Pacific 1985–2001”, Defense & Security Analysis 21(3), 243-265.

Sandler, T. and George, J. (2016), “Military Expenditure Trends for 1960–2014 and What They Reveal”, Glob Policy, 7: 174–184.

Sandler, T. and K. Hartley (2001) Economics of Alliances: The Lessons for Collective Action. Journal of Economic Literature 39 (3) 869-896.

Springborg, R. (2011), “Economic Involvement of Militaries”, International Journal of Middle East Studies 43 (3): 397-399.

Roodman, D. (2009). A note on the theme of too many instruments. Oxford Bulletin of Economics and Statistics 71, 135-158.

Pesaran, H. (1997), The role of econometric theory in modelling the long run, Economic Journal, volume 107(440), 178–191.

Pesaran, M. H., Shin, Y. and Smith, R. J.,2001. Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, volume 16, 289–326.

Perlo-Freeman, S. 2017. “SIPRI’s New Long Data-set on Military Expenditure: The Successes and Methodological Pitfalls.” Defence and Peace Economics 28(4): 404–421.

Smith, R. P. 2017. “Military Expenditure Data: Theoretical and Empirical Considerations.” Defence and Peace Economics 28(4): 422–429.

Smith, R. (1995) The demand for military expenditure. In Handbook of Defense Economics, edited by K.Hartley and T. Sandler. Amsterdam: North Holland, 69-87.

SIPRI (2017) SIPRI Year Book, Stockholm International Peace Research Institute, New York: Oxford University Press.

Table 1 Top Countries by Defence Burden (Military Expenditures to GDP)

Rank	Country	Defence Burden 2016
1	Oman	**16.7%**
2	Saudi Arabia	**10.4%**
3	Congo	**7.0%**
4	Algeria	**6.7%**
5	Kuwait	**6.5%**
6	Israel	**5.8%**
7	Russian Federation	**5.3%**
8	Iraq	**4.8%**
9	Bahrain	**4.8%**
10	Jordan	**4.5%**

Source: SIPRI (2017)

Table 2: Strategic clusters by country in the MENA region

2.1 - Local Cluster

Country	**Strategic Cluster**				
Algeria	Morocco (942)	Israel (3223)			
Bahrain	Iran (768)	Israel (1631)	Saudi Arabia (604)	Iraq [1970 -1990] (1035)	
Egypt	Iran (2297)	Israel (612)	Saudi Arabia (1472)	Iraq [1970 -1990] (1429)	
Iran	Saudi Arabia (1268)	Israel (1789)	Iraq (1970 - 1990) (941)	Turkey (1816)	Syria (1387)
Iraq	Iran (941)	Israel (867)	Turkey (991)	Saudi Arabia (1044)	Syria (467)
Jordan	Iran (1668)	Israel (142)	Syria (534)	Saudi Arabia (1147)	Iraq [1970 -1990] (762)
Kuwait	Iran (687)	Israel (1231)	Iraq [1970 - 1990] (565)	Saudi Arabia (647)	
Lebanon	Syria (307)	Israel (326)	Saudi Arabia (1423)		
Libya	Algeria (1553)	Egypt (1353)	Tunisia (1117)	Morocco (2439)	
Morocco	Algeria (942)	Saudi Arabia (5165)	Israel (3964)		

Oman	Saudi Arabia (1144)	Yemen (1023)	United Arab Emirates (301)			
Qatar	Saudi Arabia (639)	United Arab Emirates (345)	Israel (1721)			
Saudi Arabia	United Arab Emirates (896)	Iran (1268)	Israel (1284)	Iraq (1970 - 1990)	Kuwait (647)	Qatar (639)
Syria	Lebanon (307)	Saudi Arabia (1346)	Israel (569)	Turkey (570)	Iraq [1970 - 1990] (467)	Iran (1387)
Tunisia	Algeria (993)	Libya (1117)				
United Arab Emirates	Iran (998)	Saudi Arabia (896)	Israel (2058)	Qatar (345)	Iraq [1970 -1990] (1473)	
Yemen	Saudi Arabia (990)					
Israel	Saudi Arabia (1284)	Egypt (612)	Syria (569)	Iran (1789)	Iraq [1970 -1990] (867)	

2.2 - Regional Cluster

Iran	Israel	Russia (2000 - 2014)	Turkey	Iraq (1980 - 1990)

2.3 - International Cluster

United States	Soviet Union: 1970 – 1990

Note: numbers in parenthesis include distance in KM (gravity center of the country as per Google Map: Link- https://www.distancefromto.net/ [Accessed October 2017]).

Table 2: Fixed Effect Model – Sample Period: 1970 - 2015

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
GDP(-1)	1.0641***	1.0717***	1.0682***	1.0787***	1.0706***	1.0905***	1.0796***
OG(-1)	-0.5113***	-0.5977***	-0.5106***	-0.5833***	-0.5249***	-0.5479***	-0.5117***
∆G7GDP(-1)	-0.0059	-0.0124	-0.0060	-0.00009	-0.0032	-0.0080	-0.0054
ARBL(-1)	0.7843***	----	0.7904***	0.8674***	0.6987***	-0.1081***	0.5451***
GCC(-1)	----	0.5971***	----	----	----	----	----
NATR(-1)	-0.2203***	-0.1439***	-0.2226***	-0.1566***	-0.1916***	-0.0298	-0.2069***
WLCTH(-1)	0.0484*	0.0665**	----	0.0517*	0.0499*	0.2223***	0.0474***
NWLCTH(-1)	----	----	0.0335	----	----	----	----
RLTH(-1)	-0.0876***	-0.0420	-0.0785***	-0.1120***	-0.0395	-0.1081***	-0.0551**
GLTH(-1)	0.2844***	0.0694	0.2833***	----	----	----	----
NICM(-1)	----	----	----	0.6278***	----	----	----
NEX(-1)	----	----	----	----	0.0234	----	----
NTOT(-1)	----	----	----	----	---	-0.2077***	----
Doomsday(-1)	----	----	----	----	----	----	2.8840***
F-Test P-Value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Number of Obs	810	810	810	810	810	810	810

*** 1% significance level, ** 5% and * 10%

Table 3-A: Dynamic Panel-Data - ARDL Model - Long Run Coefficients – Sample: 1970 -2015

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
GDP(-1)	0.6604***	0.6402**	0.7240***	0.5722***	1.4911***	0.5655***	0.5521***
OG(-1)	-0.1384***	-0.1529	-0.1287	-0.2270***	-0.9002***	-0.2003**	-0.1666*
ΔG7GDP(-1)	-0.0095	-0.0598***	-0.0192***	-0.0152**	-0.0154***	-0.0221***	-0.0191**
ARBL(-1)	0.7372***	----	0.6691***	0.7199***	-0.2230**	0.6250***	0.6483***
GCC(-1)	----	0.2253	----	----	----	----	----
NATR(-1)	-0.0686	0.0815	-0.0925	-0.0110	0.1090*	-0.0197	-0.0043
WLCTH(-1)	0.0151	0.0364	----	0.0424**	0.1340***	0.0060	0.0417*
NWLCTH(-1)	----	----	0.0144	----	----	----	----
RLTH(-1)	-0.0493***	-0.0880**	-0.0374*	-0.0271	-0.0214	-0.0067	-0.0188
GLTH(-1)	0.18456***	-0.0518	0.1520**	----	----	----	----
NICM(-1)	----	----	----	0.0993	----	----	----
NEX(-1)	----	----	----	----	-0.1319***	----	----
NTOT(-1)	----	----	----	----	---	-0.0240	----
Doomsday(-1)	----	----	----	----	----	----	-0.0653

*** denotes 1% significance level, ** 5% and * 10%.

Table 3-B: Dynamic Panel-Data - ARDL Model - Short Run Representation – Sample: 1970-2015

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
CoinEq	-0.1711***	-0.1000***	-0.1608***	-0.1722***	-0.11794***	-0.1734***	-0.1601***
ΔGDP	0.3968**	0.3772**	0.4080**	0.4345**	0.5523***	0.4006**	0.4216**
ΔOG	-0.1884	-0.1710	-0.1890	-0.1990	-0.2277	-0.1947	-0.1932
Δ(ΔG7GDP)	-0.0065	-0.0091*	-0.0068	-0.0064	-0.00568	-0.0069	-0.0059
ΔARBL	0.3012***	----	0.2820***	0.3061***	0.1919**	0.2759***	----
ΔGCC	----	0.3262*	----	----	----	----	----
ΔNATR	-0.0092	0.0397	-0.0060	-0.0021	0.0171	0.0063	0.0124
ΔWLCTH	-0.0870	-0.2417	----	-0.0902	-0.0312	-0.1549*	-0.0835
ΔNWLCTH	----	----	0.0414	----	----	----	----
ΔRLTH	-0.5759	-0.5343	-0.6531	-0.5685	-0.5362	-0.5322	-0.5774
ΔGLTH	0.0759**	0.0435	0.0460	----	----	----	----
ΔNICM	----	----	----	0.06597	----	----	----
ΔNEX	----	----	----	----	0.0203	----	----
ΔNTOT	----	----	----	----	----	0.4909	----
ΔDoomsday	----	----	----	----	----	----	1.2815**
β_0	-2.040***	0.9346***	-1.7710***	-0.994***	0.1919**	-0.4345***	-0.6399***

*** denotes 1% significance level, ** 5% and * 10%. See Table 2 notes for model and variable descriptions.

β_0 is the intercept term and the cointegration equation coefficient is denoted by CoinEq.

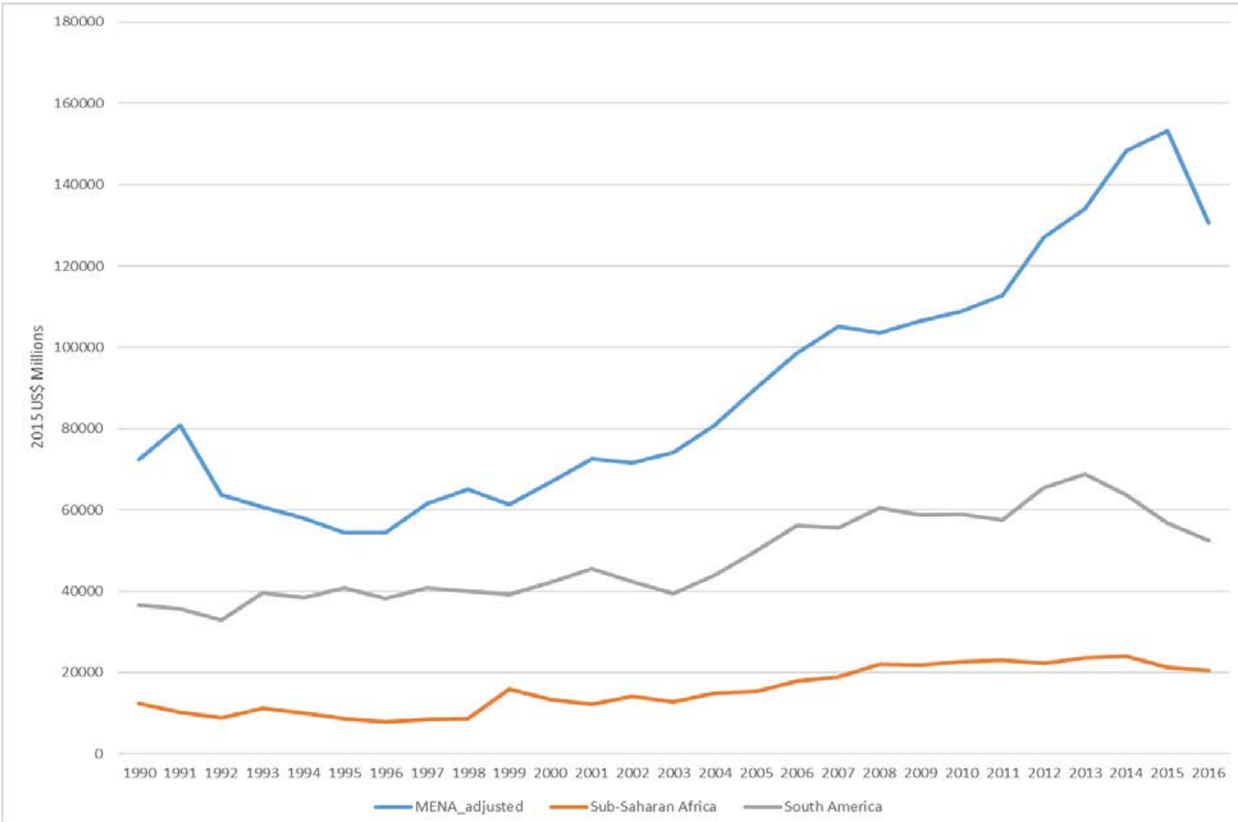
Table 4: Dynamic Panel-Data Estimation - Two-Step System GMM – Sample: 1970 - 2015

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
GDP(-1)	1.1890***	1.1549***	1.0840***	1.5634*	1.0299*	0.8820*	0.8830**
OG(-1)	-0.7138**	-0.7300***	-0.6107*	-1.4135*	-0.7422**	-0.6644**	-0.7296***
ΔG7GDP(-1)	-0.0074	-0.0061	-0.0059	0.0125	-0.0068	-0.0018	0.0100
ARBL(-1)	0.0321	0.0265	----	-0.0165	-0.0092	-0.0034	-0.0123
GCC(-1)	----	----	0.0281	----	----	----	----
NATR(-1)	-0.0087	-0.0032	-0.0300	0.1538	0.0515	0.0922	0.1152
WLCTH(-1)	0.1739*	----	0.1682	0.2195*	0.1550	0.2091**	0.1885**
NWLCTH(-1)	----	0.1536	----	----	----	----	----
RLTH(-1)	-0.1217	-0.1046	-0.0895	-0.1937**	-0.1088	-0.1451	-0.1536**
GLTH(-1)	-0.0288	-0.0537	-0.1021	----	----	----	----
NICM(-1)	----	----	----	0.6527	----	----	----
NEX(-1)	----	----	----	----	-0.0141	----	----
NTOT(-1)	----	----	----	----	----	-0.0849	----
Doomsday(-1)	----	----	----	----	----	----	3.4240*
Hansen test of overidentification	0.7680	0.8280	0.7030	0.8720	0.7380	0.7070	0.9110
Number of Obs	752	752	752	720	752	752	752

*** 1% significance level, ** 5% and * 10%

- Sargan–Hansen test of overidentifying restrictions regresses the residuals from the GMM regression on all instruments. The null hypothesis for this test is that all instruments are uncorrelated with the residual.

__Figure 1 Trends in Military Expenditures: Selected Regions__



Source SIPRI (2017)